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IBR Ride-Through

Overview and Fundamentals

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WECC "Reliability in the West" Webinar Series

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NERC Essential Reliability Services

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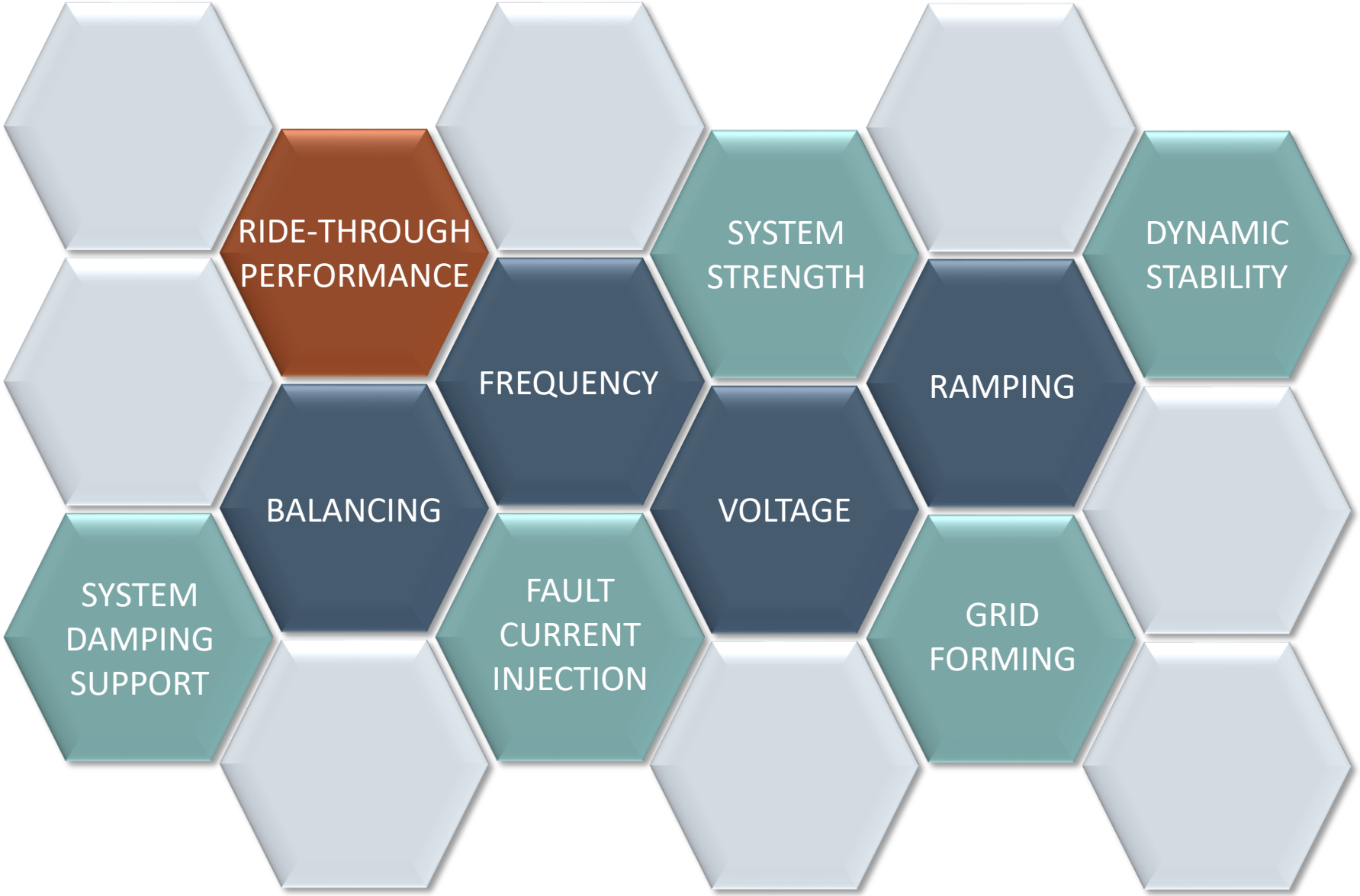
NERC Essential Reliability Services



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Generator Ride-Through

The ability of a generator (or power plant) to withstand short-term grid disturbances and continue to reliably operate

- ***Critical*** component of grid reliability and stability
  - Continuity of generation necessary for continuity of load
  - Minimize disruption to electricity supply to end-use customers

- Performance standards and requirements mandate certain levels of ride-through capability for generators

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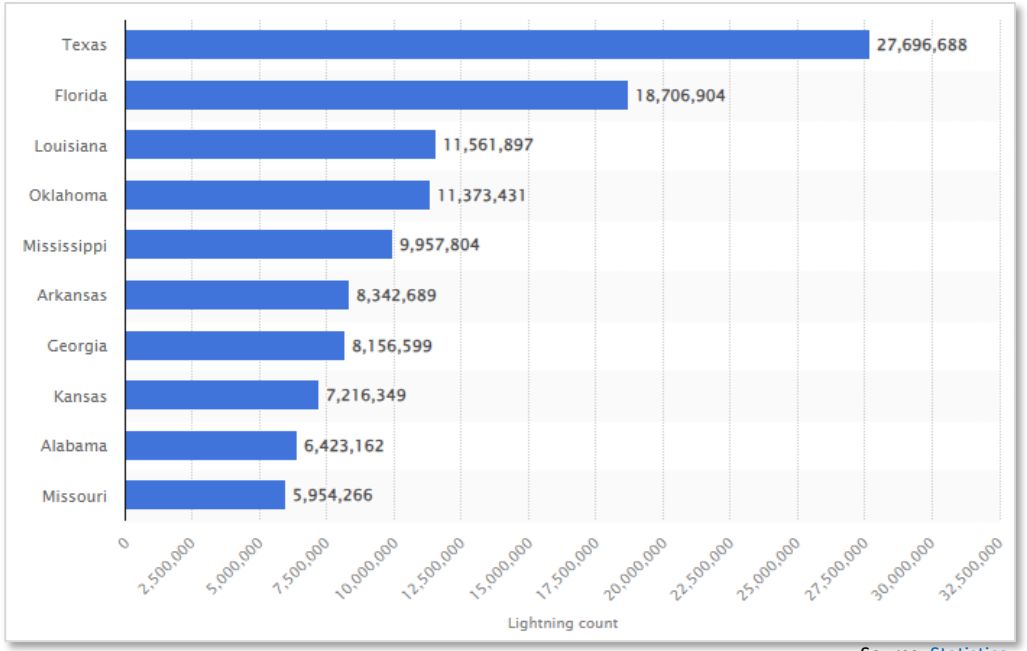
“Short-Term Grid Disturbances”

- Lightning strikes
- Equipment failures
- Animal interference
- Wildfires and smoke
- Natural disasters and storms
- Tree contact
- Cyber or physical attack
- Etc.



Source: Statistica

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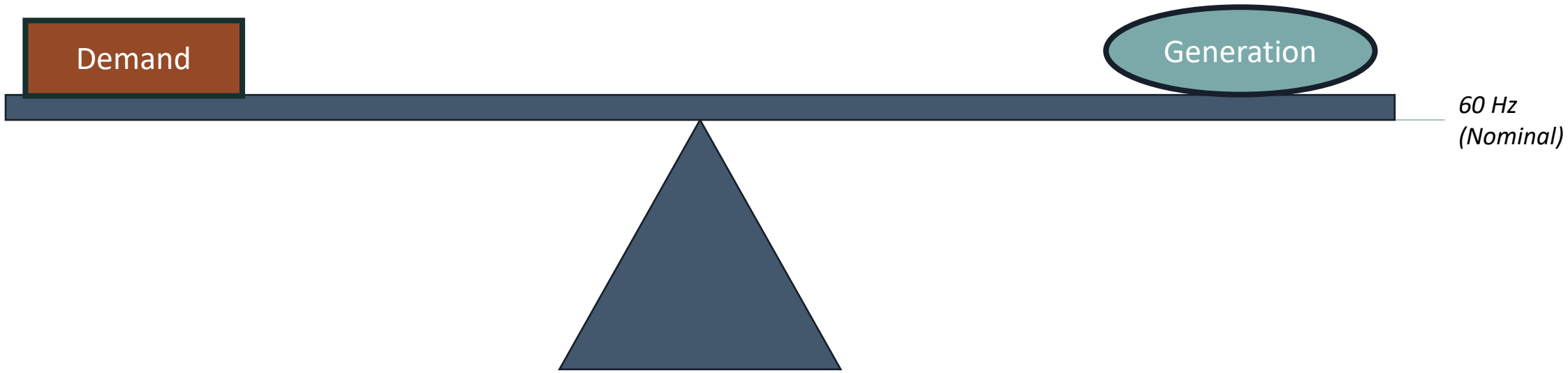
Grid Frequency Stability



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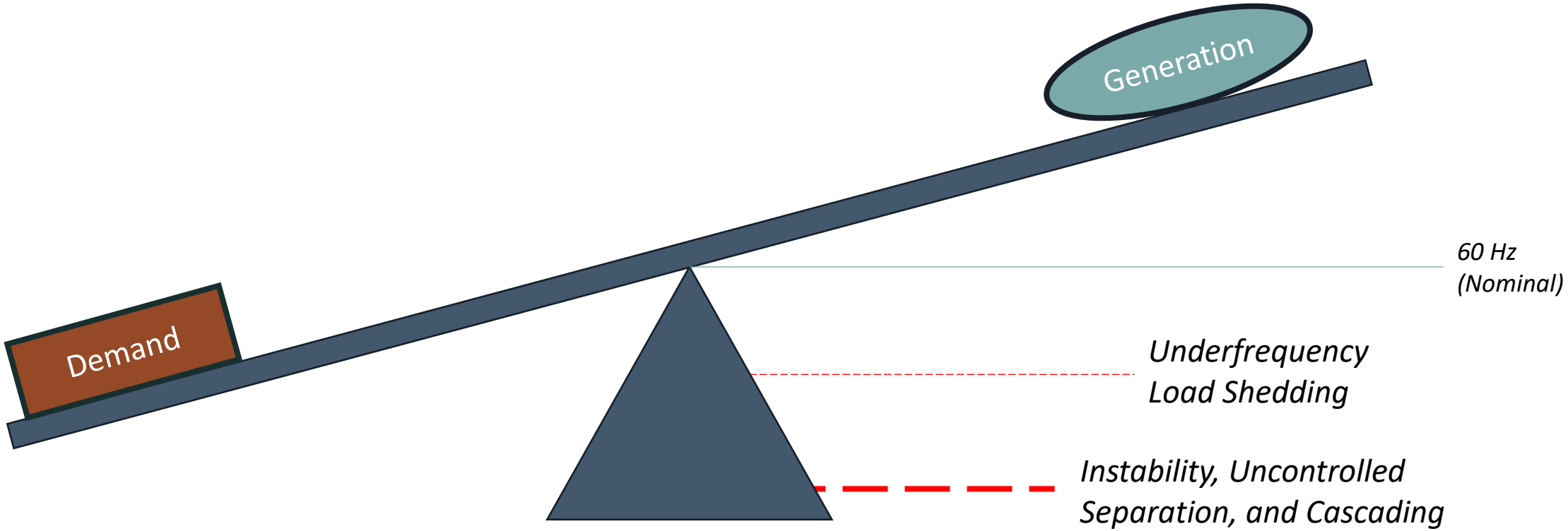
Grid Frequency Stability



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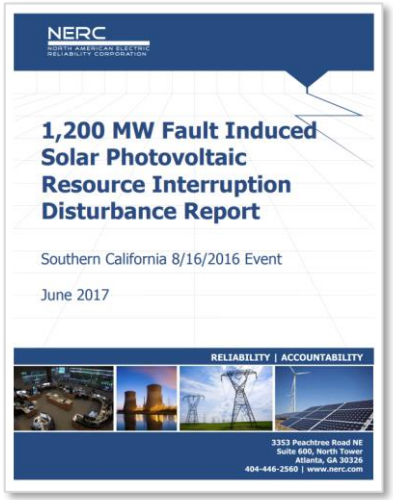
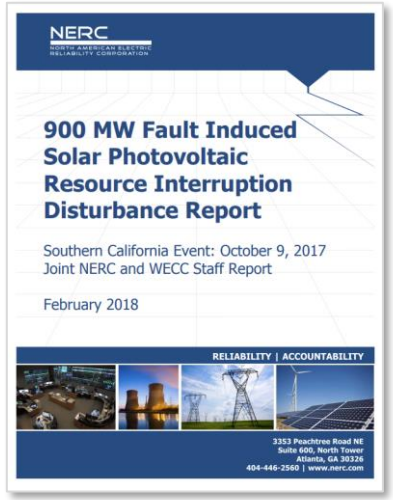
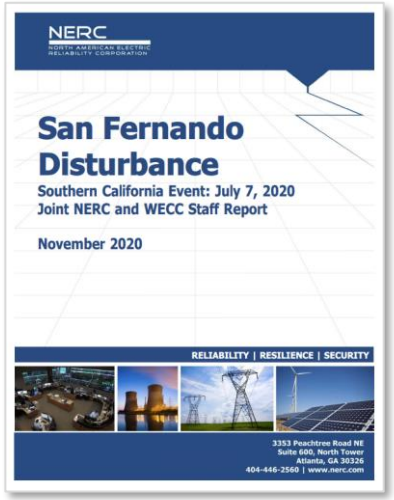
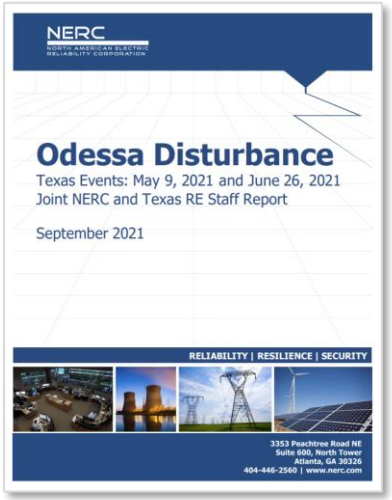
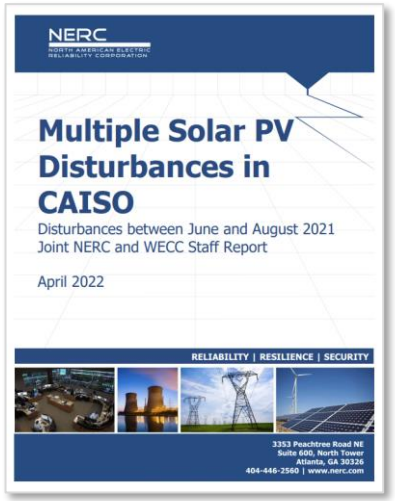
NERC Disturbance Reports

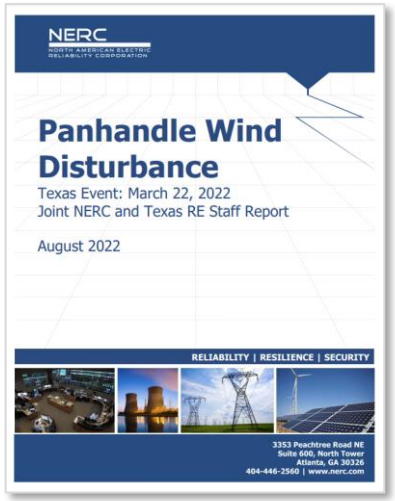


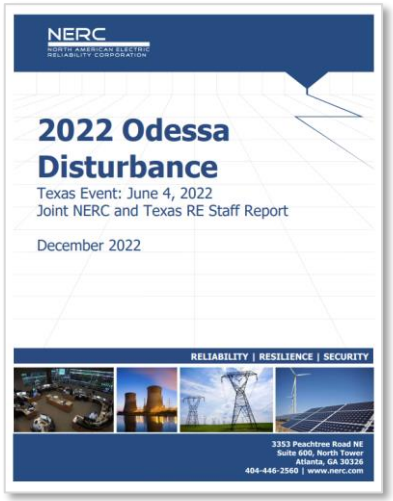


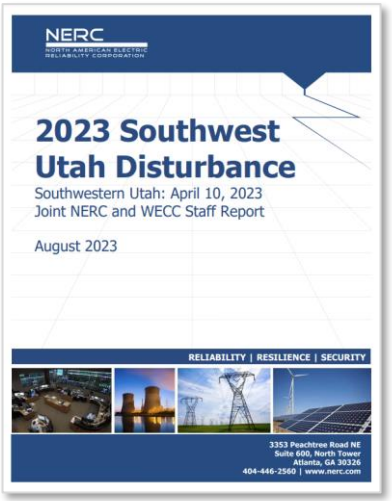


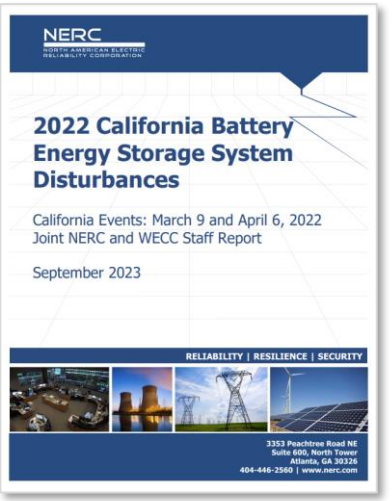












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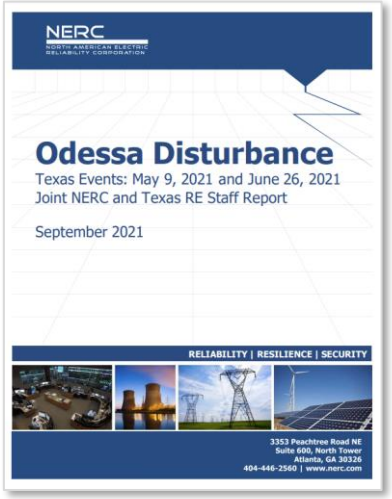
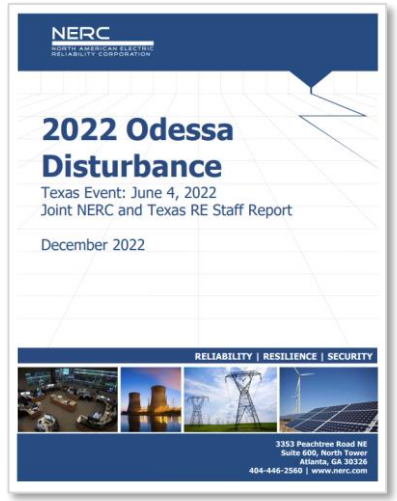
Need for Immediate Action



- **Ride-Through Standard In Lieu Of PRC-024-3:** The PRC-024 standard is not effectively or efficiently addressing a systemic reliability gap of inverter-based resources tripping for POI voltages within the "no trip zone" curves. Updates were recently made to PRC-024-3 to add clarity to the expectations; however, newly interconnecting resources are being installed with hidden protections within the inverter that will trip for local inverter terminal conditions regardless of POI voltage conditions. This has been shown to be a systemic issue in nearly all past disturbances analyzed and is not expected to be addressed in existing facilities since these limits are hard-coded into the inverters.[5] Furthermore, PLL loss of synchronism, dc reverse current, wind turbine failures,[6] and many other issues exist that are not directly related to voltage and frequency protection. Lastly, facilities most commonly have their voltage and frequency protection set "for compliance with PRC-024" rather than based on equipment ratings within the facility. Multiple GOs/GOPs have been unable to identify what is actually being protected and have stated that they are set based on compliance. This is a misinterpretation of the standard and has led to degraded performance due to unnecessary tripping events. Based on the growing evidence and ongoing work to investigate poorly performing resources during fault events, NERC recommends that a comprehensive generator ride-through standard be implemented either as a NERC Reliability Standard or as part of the FERC Generator Interconnection Agreement.

- **There is an immediate need for a performance-based, comprehensive generator ride-through standard.** NERC staff submitted a SAR to the NERC Standards Committee that proposed the complete overhaul of PRC-024-3 and replacing it with a performance-based comprehensive ride-through standard that ensures generators remain connected to the BPS during system disturbances. That SAR was endorsed by the NERC Standards Committee in April 2022. Project 2020-02 was recast to begin developments of the replacement for PRC-024-3. The 2022 Odessa Disturbance reiterates the criticality and strong need for this standard enhancement, and NERC wholly supports the expeditious development and approval of this enhanced standard by industry. The standard needs sufficient clarity and specificity to ensure all associated failure modes during ride-through events are accounted for in the standard.



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Trace the Problem

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Same Team Mentality

- Decarbonization depends on reliable operation of a clean and predominantly inverter-based generation fleet
- Equipment standards and performance requirements must ensure reliable operational performance
- Addressing ride-through performance is ***Step 0*** in tackling the more difficult reliability challenges ahead during the energy transition
  - Energy adequacy
  - Grid stability
  - System strength
  - Oscillations
  - Controller interactions
  - Inertia and FFR
  - IBR fault current and relaying
  - Etc.

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